

SOUND BARRIER SYSTEMS

The Standard Specifications are revised as follows:

SECTION 620, BEGIN LINE 1, DELETE AND INSERT AS FOLLOWS:

SECTION 620 – ~~BLANK~~ SOUND BARRIER SYSTEMS

620.01 Description

This work shall consist of furnishing materials and placement of a sound barrier system and a coping in accordance with 105.03.

620.02 General Design Requirements

10 *The sound barrier system shall be either wall mounted, bridge mounted or ground mounted, and shall consist of wall attachments or post foundations, vertical support posts, and sound barrier panels.*

All appurtenances behind, in front of, under, over, mounted upon, or passing through the wall, such as drainage structures, fire hydrant access, highway signage, emergency access, utilities or appurtenances shown on the plan, shall be accounted for in the design of the sound barrier system.

20 *If the sound barrier manufacturer needs additional information to complete the design, the Contractor shall be responsible for obtaining such information. The Contractor shall be responsible for field verifying wall locations in areas of existing lighting poles. The wall shall be realigned and designed to box out openings where conflicts occur with the existing light pole. The Contractor shall establish the existing locations of all underdrain outlets in the final wall plans.*

The sound barrier wall design shall follow the general dimensions of the wall envelope as shown on the plans. The top of the sound barrier shall be at or above the acoustical profile line shown, unless noted. Overhead utilities that are within 6 ft (2m) from the barrier shall be permanently relocated.

30 *A sound barrier system shall be selected from the Department's list of approved Sound Barrier Systems. Approved systems must be on the approved list at the time of letting. The materials used in the fabrication of the sound barrier system shall be the same as those used for approval of the sound barrier system.*

620.03 Design Criteria

40 *Modifications, other than the basic modifications necessary to erect a sound barrier system to an existing bridge, are not included in this contract. The construction of a separate bridge to accommodate a structure mounted sound barrier system is not included in this contract. If such work is necessary, an extra work order may be developed in accordance with 109.05.*

The structural design of the sound barrier system shall be in accordance with the AASHTO Guide Specifications for Structural Design of Sound Barriers, except as noted herein.

All materials shall have a minimum predicted maintenance free structural and acoustical lifespan of 20 years. All colorings and coatings shall have a minimum predicted maintenance free lifespan of 10 years.

The types of acoustic sound barrier systems that are accepted are as follows:

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Type 1, single sided absorptive, sound barrier systems and their components shall be designed to achieve a sound transmission loss equal to or greater than 20 decibels at all frequencies when tested in accordance with ASTM E 90. Type 1 sound barrier systems shall be designed to have a minimum noise reduction coefficient of 0.80 on the roadway side. Type 1 sound barrier systems shall be tested in accordance with ASTM C 423. The ratio of sound absorptive material surface area to total surface area, including posts, shall be greater than 90 percent. Material samples for this test shall be provided with the coating applied, so as to determine that the color coating does not inhibit the acoustic performance. The sample shall be mounted in accordance with ASTM E 795, Type A.

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Type 2, double sided absorptive, sound barrier systems and their components shall be designed to achieve a sound transmission loss equal to or greater than 20 decibels at all frequencies when tested in accordance with ASTM E 90. Type 2 sound barrier systems shall be designed to have a minimum noise reduction coefficient of 0.80 on the roadway side, and a minimum noise reduction coefficient of 0.70 on the non-roadway side. Type 2 sound barrier systems shall be tested in accordance with ASTM C 423. The ratio of sound absorptive material surface area to total surface area, including posts, shall be greater than 90 percent. To determine that the color coating does not inhibit the acoustic performance, material samples for this test shall be provided with the coating applied. The sample shall be mounted in accordance with ASTM E 795, Type A.

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A type 2 barrier system may be substituted, with written approval, for a type 1 barrier system.

Type 3, reflective, sound barrier systems and their components shall be designed to achieve a sound transmission loss equal to or greater than 20 decibels at all frequencies when tested in accordance with ASTM E 90.

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A type 1 or a type 2 barrier system may be substituted, with written approval, for a type 3 barrier system.

The sound barrier system shall be designed to withstand wind pressure as shown on the plans, as applied perpendicular to the barrier, in each direction.

All molded finishes shall have a 1.0 in. (25 mm) minimum relief. Relief is defined by material that is provided in excess of the minimum wall thickness required to meet the Noise Reduction Coefficient required for the absorptive surfaces. Fluted finishes shall be coped at each end to avoid cracking. Each wall shall have the selected finish used throughout the wall on either the roadway or non-roadway sides.

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All rolled finishes shall have a minimum 0.75 in. (19 mm) impression.

100 *Caisson footings, vertical support posts, and connections for ground mounted sound barrier shall be designed for 15 ft (5 m) post spacing. The foundation design shall use the COM 624P or LPILE Program. The foundation design shall be based on the soil model shown on the plans based on cyclic loading and shall consider the effects of a sloping ground surface. The post deflection shall be limited to $L/100$, measured from the top of the caisson to the top of the wall. The foundation depth shall not be less than 7.5 ft (2.2 m) and shall not exceed the depth of the soil model except where the Contractor elects to drill deeper borings to extend the model. The foundation diameter shall not be less than 18 in. (450 mm) and shall not be less than 6 in. (150 mm) larger than the diagonal dimension of the post being used. The foundation is to be designed by the sound barrier manufacturer.*

Reinforced masonry vertical support posts shall be faced to match the adjoining wall in color and texture.

110 *Vertical support posts shall be attached to caisson footings by means of anchor bolts, or embedded wide flange steel posts. Members shall use the minimum wind loads specified in the plans.*

Base-plated or embedded reinforced precast concrete posts may be substituted for wide flanged steel posts with the approval of the Department. The approval process will be through the shop drawings approval. Sixteen foot post spacing will be permitted with precast concrete posts.

120 *The post spacing for sound barriers mounted on any structure or barrier shall be limited to a distance that does not overstress the existing structure or barrier. The spacing shall also be limited to a distance that allows the sound barrier to conform to the existing horizontal and vertical alignments. The allowable loads on a structure or barrier will be shown on the plans. If no allowable loads are shown, the Contractor shall contact the project designer for the information.*

Fire hydrant access points shall be designed with additional reinforcement or bracing and protective coating around the opening as necessary to maintain structural integrity.

130 *The bottom of ground mounted sound barrier shall be embedded a minimum of 6 in. (150 mm) into the ground. The bottom of wall mounted or bridge mounted sound barrier shall follow within 3 in. (75 mm) a profile 6 in. (150 mm) below the top of the existing concrete barrier railing or wall. Changes in elevation shall be accomplished by stepping the sound barrier sections at the vertical support posts. Steps shall not exceed 3 ft (1 m).*

140 *Corrugations, ribs, or battens on sound barrier panels shall be oriented vertically when erected. The sound barrier shall be designed to prevent entrapment and ponding of water. The sound barrier shall not be designed with openings promoting the perching or nesting of birds, or the collection of dirt, debris, or water. The sound barrier shall not be designed with hand holds or grips promoting scaling or climbing of the system.*

Sound barrier systems utilizing stacked panels shall have ship-lapped, or tongue and groove horizontal joints or any other design which arrests the passage of light and sound.

The ends of the sound barrier shall be tapered or stepped down to a height of 8 ft (2.6 m) within the sound barrier end transitions or as shown on the plans. Where guardrail energy absorbing terminals are to be attached to sound barrier, the sound barrier shall be designed to meet attachment requirements.

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The Contractor shall submit a minimum of three alternative textured finishes for the roadway side and non-roadway sides of the wall to the Office of Roadway Services.

The sound barrier system can incorporate a single or two color combinations. If a two-color combination is used then a designed repetitive pattern shall be used. This repetitive pattern shall be 70/30 or higher favoring one color. The Contractor shall submit at least five different colors and/or color combinations to the Office of Roadway Services from the following colors.

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- (a) light and dark grey,*
- (b) light and dark brown,*
- (c) light and dark tan,*
- (d) light and dark taupe,*
- (e) beige,*
- (f) cream,*
- (g) coffee,*
- (h) yellow,*
- (i) blue*

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These colors will be narrowed down to a minimum of at least three colors that will be presented to the public for their input in accordance with 620.06. The color on each face of the same panel may be different. Vertical support posts shall match the sound barrier panel color unless directed by the Engineer. If a two-color pattern is selected, an additional elevation drawing will be required to show the color panel pattern on the final wall. This drawing shall clearly show the different colors by shading or hatchig each similarly colored panel and listing them. The final wall pattern must be approved before production of the wall panels.

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Closure plates shall be provided where new sound barrier is constructed adjacent to existing sound barrier. Where bridge mounted walls cross over expansion joints, expansion closure plates shall be used. The wall manufacturer shall provide expansion closure plates for each expansion joint unless directed otherwise. The minimum thickness of closure plates shall be 0.1875 in. (4.5 mm).

The calculations for the sound barrier earth retaining panels must show that the walls are adequate for earth retention. The earth retention areas shall be shown on the plans. The exposed face of the sound barrier earth retaining panel will match the adjacent panel's color and texture.

190 **620.04 Submittals**

The Contractor shall submit one copy of the design computations for approval. If the computations are computer generated, one sample set of hand calculations, for one wall location shall also be submitted. The Contractor shall submit four sets of design drawings for approval after the design computations are approved and before beginning wall construction operations. Design computations and design drawings shall be signed and sealed by a professional engineer.

200 (a) *The design drawings shall include all details, dimensions, quantities and cross sections necessary to construct the sound barrier systems and shall include but shall not be limited to the following:*

1. *A plan and elevation sheet or sheets for each sound barrier systems location.*
2. *An elevation view of the sound barrier systems which shall include the elevation at the top of the wall at all horizontal and vertical break points at least every 50 ft (15 m) along the face of the wall.*
- 210 3. *A plan view of the wall that indicates the offsets from the construction centerline to the face of the wall at all changes in horizontal alignment. A plan view and elevation view which detail the placing position.*
4. *A typical cross section or cross sections showing elevation relationship between ground conditions and the sound barrier systems locations.*
5. *All general notes required for constructing the wall.*
- 220 6. *Each sheet shall show the complete project identification number.*
7. *All horizontal and vertical curve data affecting the wall.*
8. *Aggregate pad with No. 8 coarse aggregate shall be included that extends 4 in. (100 mm) outside of each side of the panel and 4 in. (100 mm) below the bottom of the panel.*
9. *A listing of the summary of quantities on the elevation sheet for each wall.*

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(b) *The design computations shall include all structural design calculations, and vertical support post design calculations.*

(c) *For bridge mounted installations, the design weight and mass of the sound barrier and support systems.*

(d) *The detailed plan of aesthetic treatment for the entire sound barrier system, manufacture recommended installation requirements and sequence of construction, and a detailed bill of materials shall be included with the design drawings.*

(e) *The design drawings shall accommodate all existing poles, i.e., utility, traffic, etc., drainage pipes, underdrain outlets, and bridge expansion joints.*

MATERIALS

620.05 Materials

Materials shall be in accordance with the following:

<i>Cast-in Place Portland Cement Concrete, Class A</i>	<i>702</i>
<i>Coarse Aggregate, Class D or Higher, Size No. 8.....</i>	<i>904</i>
<i>Coarse Aggregate, Class A or Higher, Size No. 91</i>	<i>904</i>
<i>Fine Aggregate, Size No. 23.....</i>	<i>904</i>
<i>Paint</i>	<i>909.02</i>
<i>Portland Cement</i>	<i>901.01(b)</i>
<i>Precast Portland Cement Concrete</i>	<i>707</i>
<i>Reinforcing Steel</i>	<i>910.01</i>
<i>Structural Aluminum Posts</i>	<i>910.14(d)</i>
<i>Structural Steel.....</i>	<i>910</i>
<i>Water</i>	<i>913.01</i>

Steel structural components shall be in accordance with ASTM A 36. Structural steel components shall be hot dipped galvanized in accordance with ASTM A 123, coating grade 100 or painted in accordance with 619.11 and 619.12. Exposed surfaces of galvanized components shall be coated in accordance with 619.09(b). The galvanized surfaces shall be prepared using a light brush-off blast cleaning in accordance with SSPC SP7/NACE No. 4. The surface profile shall be 15 to 30 microns in accordance with ASTM D 4417, prior to painting.

All structural steel hardware shall be in accordance with ASTM A 325 and shall be hot dipped galvanized in accordance with ASTM A 153 or shall be made of nonferrous material or stainless steel. All other non-structural fastening devices shall be made of nonferrous metal or stainless steel. Plastic members shall be connected with either screws or bolts. Aluminum members shall be connected with stainless steel fasteners. Anchor bolts shall be of the size shown with a minimum of 10 in. (250 mm) of 7NC threads on the upper end. Anchor bolts shall be in accordance with ASTM F 1554. The threads, nuts, and washers shall be galvanized in accordance with ASTM A 153 or be mechanically galvanized and conform to the coating thickness, adherence, and quality requirements of ASTM A 153, where required.

Either material used to increase sound absorption shall be manufactured in accordance with ASTM C 612. Mineral wool shall have a minimum density of 6 lb/ft³ (96 kg/m³), shall absorb less than 1 percent of water when tested in accordance with

ASTM C 553, and shall be noncorrosive and nonhygroscopic. The filler material shall be fastened to the sound barrier system so as to prevent sagging when in a saturated condition. Test reports shall be submitted from an appropriate independent agency verifying that the filler material does not sag if separated after saturation and draining of the sound barrier system when in service, and that the acoustic qualities of the material are in accordance with the requirements herein after completion of testing.

Solid Portland cement concrete, composite concrete, or masonry block shall be coated and/or contain an integral pigment, as specified by the manufacturer and meeting the specified color requirements. The integral pigment shall be certified to be in accordance with ASTM C 979. The integral pigment and/or coating shall be tested for Accelerated Weathering. The test panel substrate shall be of the same portland cement concrete, composite concrete, or masonry block material used in the sound barrier system component. Cured coating or integral pigment shall not contain heavy metals that exceed the requirements of 40 CFR 261.24.

Concrete class A for the coping shall be in accordance with the applicable requirements of 702, except the coarse aggregate for pre-cast units may be Size No. 91 in accordance with 904. Reinforcing steel in the coping shall be in accordance with the applicable requirements of 703. The coping may be precast or cast-in-place.

Masonry block shall be tested in accordance with ASTM C 90 and as follows:

- (a) The average compressive strength of three units shall be a minimum of 4500 psi (31 MPa) with no single unit being less than 4100 psi (28 MPa).*
- (b) The maximum absorption shall be 6%.*
- (c) Joint reinforcement for masonry block systems shall be in accordance with ASTM A 951.*
- (d) Mortar for masonry block systems shall be in accordance with ASTM C 270; Type S, Table 1 proportion requirements.*
- (e) Portland cement-lime or mortar cement may be used. Masonry cement shall not be used. Grout for masonry shall be in accordance with ASTM C 476.*
- (f) Aggregate for masonry grout shall be in accordance with ASTM C 404.*

Certifications shall be provided for each of the materials to be supplied for the sound barrier system. Certifications shall be in accordance with a type C in accordance with 916, unless noted otherwise. A Type A certification in accordance with 916 shall be provided for compressive strength and absorption test values for masonry block, sampled and tested in accordance with ASTM C 140. All test reports required to substantiate compliance shall be in accordance with the test method/material requirements cited herein. A Department approved laboratory shall conduct the testing.

CONSTRUCTION

620.06 Public Information Meeting

The Contractor is responsible for planning and holding a public meeting to display and discuss the recommended sound barrier wall finishes and colors with the public. The meeting shall be arranged for in a locally available facility in or near the affected areas of the barrier walls at convenient times for the affected areas to review.

340 *The Contractor and the wall manufacturer shall be present at the meetings along with representatives from the Department.*

The Contractor shall coordinate all meeting activities with the Department's Hearings Manager. The Hearings Manager will make all local media contacts two weeks prior to the meeting. The Contractor shall also notify the adjacent property owners and businesses, neighborhood associations, and local planning agencies two weeks prior to the meeting. The use of colored flyers with appropriate graphics shall be developed by the Contractor and coordinated with the Hearings Manager prior to distribution.

350 *Wall colors photos shall be presented for each color in accordance with 620.03 along with photos of each available texture alternative. A minimum of three wall samples of both the roadway side and non-roadway side textures shall be presented. All samples of the wall textures shall be 2 ft x 2 ft (0.6 m x 0.6 m). Each wall shall have the selected color(s) used throughout the entire wall on either the roadway or non-roadway sides.*

Based on comments received during the meeting, the Department will select the final finishes and colors for each wall. The Contractor shall coordinate all sound barrier wall issues with the Engineer prior to ordering any materials.

360 **620.07 Construction Requirements**

The sound barrier supplier shall provide technical instruction, guidance in preconstruction activities including the preconstruction conference, and on-site technical assistance during construction. The Contractor is responsible for following installing instructions from the supplier unless otherwise directed in writing.

Clearing and grading shall be in accordance with 202 as required.

370 *The foundations for ground mounted sound barrier systems shall be constructed as shown on the shop drawings. Holes for footings shall be drained of free water prior to installing any components. Placing concrete shall be in accordance with 702.*

The integrity of the sound barrier system continuity shall be such that no gaps will be visible through any vertical joint between sound barrier panel and vertical support post, through any horizontal joint between sound barrier panels, between the bottom of any ground mounted sound barrier and the adjacent ground, or between the bottom of any wall mounted sound barrier and the top of the adjacent wall.

380 *Sound barrier wall posts shall be placed vertical with a tolerance of 1/2 in. per 10 ft (13 mm per 3 m) on each axis. Sound barrier wall posts shall be placed at the distance indicated on the plans with a tolerance of 1 in. (25 mm) from centerline to*

centerline. Sound barrier wall posts shall be aligned to within 1 in. (25 mm) when measured from a straight line from the two adjacent posts. Sound barrier wall posts shall be at the height as shown on the plans. The posts shall project above the top sound barrier wall panel by 1.5 in. \pm 0.5 in. (37 mm \pm 13 mm). The top of the sound barrier wall shall be at or above the acoustical profile. Steel posts embedded in concrete shall have bottom cover of 8 in. \pm 4 in. (200 mm \pm 100 mm). Field cut steel posts shall be primed with an organic zinc primer and painted in accordance with 619.

390 After post erection the area shall be backfilled to within 6 in. (150 mm) of the required final grade or as specified in the plans. The aggregate pad shall be placed as required. Positive drainage of the work area shall be maintained.

Sound barrier wall panels shall be placed in accordance with the plans and centered between adjacent posts. The sound barrier wall panels shall be of sufficient length to span the entire length between posts less 1/2 the width of the smallest retaining flange. All sound barrier wall panels shall be ship-lapped or tongue and groove construction. Panels that are damaged during placement shall be repaired or replaced in accordance with the manufacturer's guidance.

400 Panels may be field cut to facilitate erection in accordance with the manufacturer's recommendation. Field cut panels shall be cut to have the least impact on any patterns present in the textured or colored finish. Field cut panels or other field cut components shall be painted in accordance with the manufacturer's guidance.

All grouting and reinforcing work for masonry block systems shall be performed by masonry craftworkers holding current International Masonry Institute (IMI) Grouting and Reinforcing Certification. Proof of certification shall be submitted prior to the beginning of work.

410 The sound barrier system and sound barrier system components shall be maintained during construction. Elements of the sound barrier system that are damaged or destroyed shall be repaired or replaced as directed by the Engineer. Painted surfaces damaged during construction shall be repaired in accordance with the manufacturer's guidance. Repairs shall be in accordance with the manufacturer's guidance.

After construction of the sound barrier system the site shall be restored to the original condition with grading, seeding and sodding in accordance with the plans.

620.08 Acceptance

420 The Contractor shall submit 2 ft x 2 ft (0.6 m x 0.6 m) sound barrier panel samples in the colors and textures proposed and a 2 ft (0.6 m) sample of painted support post, prior to the approval of the shop plans. The samples will be used as a control sample to verify delivered products meet the aesthetic requirements. The sound barrier system will be accepted for color based on a visual comparison between the control sample and the color of the wall as constructed in place.

The sound barrier system will be accepted for quality based on a visual inspection of the components of the system by the Engineer. The sound barrier system shall be

430 subject to rejection due to failure to be in accordance with the requirements specified herein. In addition, the following defects may also be sufficient cause for rejection.

(a) Defects that indicate imperfect fabrication

(b) Defects in physical appearance such as cracks, checks, dents, scrapes, chips, stains, or color variations.

The Engineer will determine whether defective sound barrier shall be repaired or shall be cause for rejection. Repair, if permitted, shall be completed and approved by the Engineer.

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For precast wall panels, one verification sample will be required for each type of sound barrier system. The sample will be cut from a delivered panel and will be of sufficient size to provide for testing of sound absorption requirements in accordance with ASTM C 423 and for salt scaling resistance in accordance with Item 13 of the Obtaining Approval Section of the Sound Barrier Systems Source Approval Criteria. The verification sample will be randomly selected for testing by the Engineer in accordance with ITM 802. A testing laboratory independent from the manufacturer, supplier, and the Contractor shall perform testing. This independent testing laboratory shall arrange for shipping and testing without the aid of the Contractor. The independent testing laboratory shall submit the test results to the Engineer, with a copy to the Contractor, upon completion. Failed materials will be adjudicated as a failed material in accordance with normal Department practice in accordance with 105.03.

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For masonry blocks delivered to the site, one verification sample per contract, per source, consisting of five units will be required for testing freeze thaw durability in accordance with Item 13 in the Obtaining Approval Section of the Sound Barrier Systems Source Approval Criteria. The verification sample will be randomly selected for testing by the Engineer in accordance with ITM 802. A testing laboratory independent from the manufacturer, supplier, and the Contractor shall perform testing. This independent testing laboratory shall arrange for shipping and testing without the aid of the Contractor. The independent testing laboratory shall submit the test results to the Engineer, with a copy to the Contractor, upon completion. Failed materials will be adjudicated as a failed material in accordance with normal Department practice in accordance with 105.03.

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620.09 Method of Measurement

Sound barrier panels and sound barrier erection will be measured by the square foot (square meter) of wall surface area. The pay quantity will be based on the neat line limits of the sound barrier envelope as shown on the plans. The vertical and horizontal distance for each section of the wall defines the sound barrier envelope. The vertical distance extends from the elevation at the bottom of the lowest panel to the elevation of the acoustic profile for each section of the wall. The horizontal distance extends from centerline to centerline of adjacent posts for each section of wall. Coping will not be measured.

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620.10 Stockpiling

480 *Partial payment will be made for sound barrier panels stockpiled on the project site or at the Contractor's approved storage location within the State of Indiana. Partial payment will be based on the delivered cost of the sound barrier panels, as verified by invoices that includes freight charges. The Contractor shall furnish the invoices and all required certifications. Partial payment will not exceed 75% of the contract unit price for bridge mounted, ground mounted or wall mounted sound barrier panels. Prior to authorizing the partial payment, verification will be obtained that all required inspection has been made and that the panels are acceptable.*

Sound barrier components shall not be stored on the right-of-way unless written permission is given by the Department. Requests for permission to store materials on the right-of-way will not be accepted until after the contract has been awarded.

490 **620.11 Basis of Payment**

Wall mounted sound barrier panels, bridge mounted sound barrier panels, ground mounted sound barrier panels, wall mounted sound barrier erection, bridge mounted sound barrier erection, and ground mounted sound barrier erection will be paid for at the contract unit price per square foot (square meter).

The Department may choose to acquire additional precast sound wall panels in the colors and patterns selected on the project. A maximum of twelve panels of each type would be paid for at the invoice cost of the panels and shall be delivered to the District Office. A change order will be processed in accordance with 109.05 and shall be marked as a "Z" (federally non-participating) cost.

Payment for all costs associated with the collection of all information not shown on the plans, revisions due to conflicts, sound barrier system details, all additions or incidentals necessary to provide complete plans, any redesigning of plans or details, the public information meetings and public information planning and presentations will be paid for at the contract lump sum price for sound barrier design and layout.

Payment will be made under:

Pay Item	Pay Unit Symbol
Sound Barrier Design and Layout	LS
Sound Barrier Erection, _____, mounting type, * type**	SFT (m2)
Sound Barrier Panels, _____, mounting type, * type**	SFT (m2)
* Type of sound barrier system: (BM) bridge mounted, (GM) ground mounted, (WM) wall mounted	
** Type 1, 2, or 3.	

520 *The cost of sound barrier panel materials including vertical support posts, coping, aggregate pad mortar, grout and joint reinforcement for masonry block, fasteners, closures, expansion plates, openings and incidentals shall be included in the cost of the sound barrier panels for the type of sound barrier panels.*

The cost of substituting type 2 wall for type 1 wall or substituting type 1 or type 2 wall for type 3 wall shall be at no cost to the Department.

530 *The cost of services including the testing laboratory, delivery to the testing laboratory, certified testing personnel, and the testing and inspection of the sound barrier panels shall be included in the cost of sound barrier panels for the type of sound barrier panels.*

The cost of sampling, shipping and testing of verification samples shall be included in the cost of the sound barrier panels for the type of sound barrier panels.

The cost of the selected texture and selected color shall be included in the cost of the sound barrier panel for the type of sound barrier panels.

540 *The cost of all labor and materials to prepare and erect the sound barrier shall be included in the cost of sound barrier erection for the type of sound barrier panels.*

The cost of foundation preparation and construction with associated work shall be included in the cost of sound barrier, ground mounted.

The cost of removal or construction of concrete barrier walls is not included in the cost of sound barrier erection, wall mounted.

550 *The cost of delivery of the extra sound barrier panels to the District Offices shall be included in the "Z" item cost of the sound panels for the type of sound barrier panels.*

SOUND BARRIER SYSTEMS SOURCE APPROVAL CRITERIA

Obtaining Approval

The supplier requesting approval of a sound barrier system and inclusion on the Department's list of approved Sound Barrier Systems shall comply with the following.

- 1. The supplier shall send a letter to the office of Materials Management requesting approval of the sound barrier system. The letter shall include supporting documents, all of which shall be bound, organized and include the following, as applicable:*
 - (a) a letter requesting approval of sound barrier system*
 - (b) list of sound barrier system installations*
 - (c) inspection report of sound barrier system*
 - (d) list of all materials, specification and manufacturer*
 - (e) test report of sound transmission loss*
 - (f) test report of sound absorption average, roadway side*
 - (g) test report of sound absorption average, non-roadway side*
 - (h) test report for accelerated weathering*
 - (i) test report for flame index and smoke index*
 - (j) test report concrete resistance to scaling*
 - (k) test report steel resistance to corrosion*
 - (l) test report for filler material*
- 2. The supplier shall ensure that all tests were performed within two years from the date of submission.*
- 3. The supplier shall ensure that all tests were performed on samples selected from a production run of the product.*
- 4. The supplier shall ensure that all tests were performed in an accredited independent testing laboratory. Each test report shall be accompanied with proof of accreditation.*
- 5. The supplier shall provide evidence of prior construction of a sound wall system of the type to be approved; including location, date, and purchaser.*
- 6. The supplier shall submit an inspection report detailing the condition of a sound barrier system of the type to be approved. The inspection report shall identify the location and type of the sound wall system, and provide comments on the structural integrity of each component and the condition of any surface coatings. The inspection report shall be prepared and signed by a registered professional engineer independent from the supplier. The field location of the sound barrier system shall be in an area with a climate similar to Indiana. The sound barrier system shall have been subjected to at least two winters of exposure.*

7. *The supplier shall submit a list of all materials used in the manufacture and construction of the type of sound barrier system to be approved. The list shall include the material specification which each material component meets, and the name of the manufacturer of each material component.*
8. *The supplier shall submit a test report that shows the sound barrier system has a sound transmission loss of 20 dbl or greater for each frequency in accordance with ASTM E 90.*
9. *For absorptive wall systems type 1 and 2 the supplier shall submit a test report that shows the sound barrier system has a sound absorption average of 0.80 or greater on the roadway side in accordance with ASTM C 423 with specimens mounted in accordance with ASTM E 795, Type A.*
10. *For absorptive wall systems type 2 the supplier shall submit a test report that shows the sound barrier system has a sound absorption average of 0.70 or greater on the non-roadway side in accordance with ASTM C 423 with specimens mounted in accordance with ASTM E 795, Type A.*
11. *The supplier shall submit a test report that shows the sound barrier system complies with the accelerated weathering requirements listed below when tested in accordance with ASTM D 6695 cycle 1. Four specimens shall be used in the test, one as a reference, one to be removed from the test and evaluated at 800, 1600 and 2400 hours. The color of the specimens shall be light blue, light brown, light green, or light grey. The test report shall include a color photo of each specimen at the time of evaluation.*
 - (a) no checking in accordance with ASTM D 660*
 - (b) no blistering in accordance with ASTM D 714*
 - (c) no loss of adhesion in accordance with ASTM D 3359*
 - (d) chalking of 7 or greater in accordance with ASTM D 4214, Method C*
 - (e) color difference of 5 Δ NBS units or less as compared to the reference sample in accordance with ASTM D 2244*
12. *The supplier shall submit a test report that shows the sound barrier system has a flame spread index of 15 or less at 10 minutes, a flame spread index of 25 or less at 30 minutes, and a smoke developed index of 10 or less at 10 minutes in accordance with ASTM E 84.*
13. *For precast concrete panel systems, the supplier shall submit a test report that shows the concrete components of the sound barrier system have a mass loss 0.2 lb/1.0 ft² (91 g/0.0929 m²) or less in accordance with ASTM C 672 and as follows. At least three specimens each from a different production run shall be tested. The specimens shall have a testable surface area of 1.00 ft² (0.0929 m²) or more. The specimens shall be sealed around the edges to retain the salt solution to a depth of at least 1/8 in.*

(6 mm) over the entire surface. Before the start of the test each specimen shall be brushed clean. After each five cycles of the test all salt solution and all rinse water from each specimen shall be collected. After each five cycles the surface of each specimen shall be thoroughly rinsed to remove all loose particles. The collected liquid shall be filtered and all particles removed. The retained particles shall be dried to a constant mass and the mass determined to the nearest 0.01 lb (1 g). The test report shall indicate the mass of particles after each five cycles and the total mass after 50 cycles for each specimen. The report shall include a color photo of each specimen before and after the test.

For masonry block systems, the supplier shall submit a test report that shows the concrete masonry units have a mass loss of one percent material or less in accordance with ASTM C 1262 and as follows. The specimens shall be subjected to 100 cycles of freezing and thawing in a water test solution.

- 14. The supplier shall submit a test report that shows the steel components of the sound barrier system comply with the following corrosion requirements when tested in accordance with ASTM D 1654 and salt spray exposure in accordance with ASTM B 117. Four pairs of specimens shall be used in the test, one pair as a reference, one pair to be removed from the test and evaluated at 800, 1600 and 2400 hours. One specimen from each pair shall be scribed and one specimen shall be un-scribed. Scribed specimens shall be evaluated in accordance with procedure A, method 1. Un-scribed specimens shall be evaluated in accordance with procedure B and D. A color photo of each specimen at the time of evaluation shall be provided.*

- (a) corrosion rating shall not be less than 10*
- (b) no checking in accordance with ASTM D 660*
- (c) no blistering in accordance with ASTM D 714*
- (d) no loss of adhesion in accordance with ASTM D 3359*
- (e) no other defects in accordance with the above methods*

- 15. The supplier shall submit a test report that shows the filler material for sound barrier system in a dry and saturated state does not sag, separate, delaminate, deform or otherwise create voids that allow sound to penetrate the component.*

Maintaining Approved List

- 1. The supplier shall manage the continued approval of their sound barrier system.*
- 2. The supplier shall notify the Department of changes in material components.*

3. *The supplier shall ensure that all documents and test reports for their sound barrier system are current.*
4. *Sound barrier systems that have records at the office of Materials Management in compliance with this procedure will be maintained on the Department's list of approved Sound Barrier Systems.*

Removal from Approved List

1. *The office of Materials Management is responsible for removing sound barrier systems from the approved list.*
 2. *Sound barrier systems that are not in compliance with this procedure will be removed from the approved list.*
 3. *Sound barrier systems that exhibit poor field performance as determined by the office of Materials Management will be removed from the approved list.*
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